

Impact of Oral Frailty in Prosthodontic Care of an Aging Population

Abstract

Sri Lanka, being one of the fastest aging nations in the world, need to embrace the unprecedented pressure this has on its health and social services in a holistic manner. The risk of frailty increases with aging and the prevalence of oral hypofunction raises along with physical dependency, cognitive decline, malnutrition and multimorbidity. With the advancement in healthcare services and increased public awareness, more people are retaining their natural or rehabilitated teeth into old age. Prosthodontic management should not only emphasize proper oral function examination and treatment planning but also on home care of the prosthesis. This review will discuss the challenges and alternative prosthodontic treatment options for persons with oral frailty.

Key words: oral frailty, prosthodontic, oral hypofunction, treatment planning, post issue care

Demographic Challenges

Sri Lanka is continuously experiencing one of the fastest ageing populations in the developing world. The country with the highest proportion of older adults in South Asia. The proportion of the population over 60 years has increased from 5.3 in 1953 to 14% in 2017 and it will further rise to one quarter of Sri Lanka's population by 2030. The Western province has the highest % of elderly at 31.7%, while the Northern Province has the least at 4.8% (1). As the population of the aged of a nation increases and the working-age population shrinks, it raises social and economic questions leading to unprecedented pressure on health and As the population of the aged of a nation increases and the working-age population shrinks, it raises social and economic questions leading to unprecedented pressure on health and social services, and an emerging threat to the fiscal stability of the nation. The need of the

As the population of the aged of a nation increases and the working-age population shrinks, it raises social and economic questions leading to unprecedented pressure on health and social services, and an emerging threat to the fiscal stability of the nation. The need of the hour is to bring together governments, civil society, multinational agencies, professionals, academia, the media, and the private sector for a concerted, catalytic, and collaborative action to improve the lives of older people, their families, and the communities in which they live (2).

Why is oral frailty a challenge?

Aging comes with health problems, care dependency, and an elevated frailty risk. According to Shiraishi (3), 71% of hospitalized rehabilitation patients and 91% of hospitalized acute care patients have impaired oral health. The prevalence of coronal dental caries, root surface caries, periodontal disease, tooth loss, halitosis, xerostomia, oral pain, and orofacial discomfort is high in the population of frail older adults. This poor oral health condition can be attributed to age, physical dependency, cognitive decline, malnutrition, low skeletal muscle mass and strength, and factors related to multimorbidity. This problem is compounded by the lack of knowledge and interest in oral problems among the general health care professionals and workers.

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Replacement of missing or damaged teeth by prosthodontic means can have an impact on the physical, psychological, and social wellbeing of an individual, especially when dealing with an older adult. Their prosthodontic care needs to take into consideration factors related to oral hypofunction. This is further complicated by their multiform dentition type, whereby the oral cavity may have natural teeth, dental restorations, crowns, bridges, dental implants, and implant-supported prosthetics.

In addition, one needs to appreciate that professional oral health care is less accessible to some frail older adults due to functional & physical limitations like restricted mobility and dexterity, disorientation, failing memory, and lack of support leading to a decrease in dental service use, oral self-care behaviour and oral health deterioration as they consciously use their sparse energy and resources for priorities other than oral healthcare.

Bidirectional relationship between oral health and general health

According to a report by the FDI (4), poor oral health and untreated oral diseases can have a “causal”, “worsening” or “association” with multiple health conditions including cardiovascular diseases and increased risk of stroke, and diabetes which have a bi-directional relationship with periodontal disease, each able to influence and worsen the other. Diabetic patients may manifest Impaired salivary gland function, exaggerated inflammatory response, as well as susceptibility to candida infection. Those with hypertension may also suffer from dry mouth, gingival hyperplasia, lichenoid reactions, and taste alteration. Rheumatoid arthritis patients often suffer from chronic pain and limited dexterity; they may manifest methotrexate-induced oral ulceration, degenerative temporomandibular joint disease, and xerostomia. Those suffering from Alzheimer’s disease may demonstrate Irreversible deterioration of cognitive function, affecting memory, coordination, emotional control, behavioral function, and motor skills which can impede their ability for dental hygiene care. Parkinson’s Disease which manifests as resting tremor, bradykinesia, postural instability and rigidity, depression, and anxiety, can precipitate involuntary jaw movements causing TMJ discomfort, cracked teeth, tooth wear, orofacial pain, and dysphagia.

Prosthodontic Care in Oral Hypofunction

Oral function, especially mastication and swallowing, declines with aging in the presence of active systemic disease due to biological and functional changes of the oral cavity, represented by tooth loss and loss of tongue and other intraoral muscles function (5,6). To manage oral hypofunction as the patient ages, it is extremely important to maintain the patients’ awareness and motivation for preventing oral frailty. Frailty is a biophysiological disorder that affects many activities of daily living, characterised by diminishing physiological reserves and resistance to stressogenic insults (7). Recently, oral frailty was proposed as a conceptualisation of age-related gradual loss of oral function, together with a decline in cognitive and physical functions, driven by a set of impairments that worsen oral daily functions that includes loss of teeth, poor oral hygiene, or difficulty in chewing associated with age-related changes in swallowing (8,9).

Therefore, any planned prosthodontic care should consider oral examination for oral hypofunction (10) namely, oral hygiene, oral wetness, occlusal force, tongue-lip motor function (oral diadochokinesis (ODK)), tongue pressure, masticatory function and swallowing function. Treatment plan based on these performance indicators can also help improve the prosthodontic home care of our aging population.

Challenges to Prosthodontic Care

Aging has its own challenges to be considered when providing any rehabilitative oral health care. It has been reported that up to 50% of patients no longer used their removable partial dentures within five years after insertion (11). The possibility of one being medically compromised, physically frail or taking medications

which are potentially xerostomic can in one way or the other compromise their ability to adapt to a new prosthesis. This can be compounded by problems associated with chewing or insufficient oral hygiene leading to malnutrition which is detrimental to the general health of the individual. As dental materials and technology continued to improve along with the awareness and accessibility of care, we can retain our teeth for longer period in life. The presence of natural teeth and fixed restorations in the oral cavity calls for meticulous oral hygiene care throughout life. The lack of a trained workforce of dental professionals equipped with the knowledge, skills, and attitudes to manage a growing frail and care-dependent population is of great concern. It has also been highlighted that the traditional education at an undergraduate level is inadequate to prepare dentists to competently manage the oral health needs of this new cohort of population-need (12).

Alternative Prosthodontic Treatment Options

1.Shortened Dental Arch (SDA)

Masticatory ability is closely related to the number of remaining natural teeth, and there is impaired masticatory ability when the patient has less than 20 well-distributed teeth. SDA is a concept that avoids extensive restorations replacing molars in clinical settings with typically ten occluding antagonistic pairs, usually up to the second premolar and generally fulfilling the requirements of a functional dentition (13). In these situations, replacement of the missing molar teeth by cantilevers, resin-bonded fixed partial dentures, implant-supported prostheses, or distal extension removable partial dentures may amount to over-treatment for patients with SDA especially the frail. In general, studies have shown that there are no clinically significant differences between patients with SDA of 3 – 5 occluding pairs and complete dental arches regarding variables such as masticatory ability, signs and symptoms of temporomandibular disorders, migration of remaining teeth, periodontal support, or oral comfort (14). However masticatory efficiency may be relevantly reduced.

2.Duplicate Dentures

In many frail and functionally dependent older adults, due to cognitive and motor function impairment, adaptation to a new prosthesis can be challenging. In such situations, relevant properties of the existing dentures such as the vertical or horizontal dimension of occlusion, phonetics, or esthetics can simply be transferred into duplicate dentures (15). The conventional method is to employ impression techniques to produce a duplicate to be used as impression tray, and as a template for the arrangement of denture teeth. Digitalization of existing dentures and processing of datasets for the fabrication of duplicate dentures with CAD/CAM-assisted subtractive or additive means or by 3-D printing (16) can also be employed if the facility is available.

3.Non-Metal Clasp Dentures (NMCD)

NMCD (17) is a viable, conservative, and cost-effective alternative for rehabilitation of partially edentulous patients. These thermoplastic denture base materials offer improved esthetics, have superior elasticity, fracture resistance, and flexibility by providing ease of insertion and removal as compared to conventional PMMA resins. The types of thermoplastic resins that can be employed for NMCD include acetyl or acetal resin like polyoxymethylene (POM); polyamides like Valplast®, Lucitone FRS and Ultimate; polyester resins like EstheShot1 (ES 1) and ES Bright; and polycarbonates. NMCD are of two types namely those with a metal structure that are rigid and those without a metal structure (non-rigid).

The advantages of NMCD include its need for minimum tooth preparation, moisture retention capacity, enhanced retention and ease of insertion and removal, decreasing the stress on the abutment teeth

and improved patient comfort, aesthetics, and biocompatibility. Its disadvantages its ease for staining and degradation, its need for special materials and techniques to finish and polish the denture, difficulty to repair or relin the denture. Therefore, it is crucial to carefully evaluate the clinical conditions of each patient to indicate NMCDs correctly, since there is no consensus as to whether they can function as definitive rehabilitations or should only be used as temporary dentures (18).

4.Root cap–retained Overlay Dentures (ROD)

The global burden of total edentulism is decreasing (19), whereas those with residual teeth is rising. In many situations, the remaining teeth usually have undergone endodontic treatment and/or exhibit reduced periodontal attachment due to continuous age dependent bone loss, resulting in an unfavorable crown-root ratio. In such situations, there is the option of shortening the clinical crown to serve as abutments in a ROD. These abutment teeth usually undergo elective endodontic treatment for the extended shortening required to provide sufficient vertical space for prosthetic rehabilitation. The advantages of ROD include increased tactile and proprioceptive feeling, reduced ridge resorption leading to higher chewing efficiency. To protect roots or tooth surfaces that are exposed to the oral cavity, abutment teeth can be covered by direct filling materials (resin composite) or by cast alloy copings (root caps). Establishing good oral hygiene is a decisive factor in preventing complications in RODs. Furthermore, chlorhexidine containing products may not be recommended for routine domestic use (20)

5.Double crown-retained removable dental prostheses (D-RDPs)

D-RPD is a hybrid of fixed abutments as primary inner crowns and removable prostheses as secondary outer frameworks (21). Depending on the retention mechanism, D-RDPs can be classified into:

- telescopic parallel crowns (friction of parallel-milled surfaces)
- conical double crowns (friction when completely seated using a “wedging effect,”)
- double crowns with additional retention modifications

Materials used for the inner and outer crowns include gold alloys, Cr–Co metal alloys, titanium, or zirconia while the commonly used attachment systems connecting overdentures & implants include bars of different designs, anchors, magnets, and locator systems. The choice of connector system is influenced by the jaw anatomy, the available space in the vertical and/or horizontal dimension, cost effectiveness, and the patient’s economic status and expectations.

Its advantages:

- effective in prosthesis stabilization about horizontal forces in cases of advanced atrophy of the alveolar ridge,
- improved crown-root ratio of abutment teeth,
- due to the coverage of the abutment teeth with the denture, the esthetic outcome is more favorable compared to conventional partial dentures with clasps,
- in case of a failing abutment tooth, the reconstruction can more easily be modified compared to a fixed dental prosthesis,
- facilitate oral hygiene measures by removing prostheses.

However, its construction demands high precision and special skills from both the dental technician and the clinician in its fabrication, increasing the total cost of the prosthesis. The bulky over contoured shape of the reconstruction may interfere with home care and supportive periodontal therapy. In addition, minor complications like decementations, veneer failure, and denture-base fractures may occur leading to the need for aftercare of D-RDPs.

Planning and Post issue care

Any prosthetic treatment for a frail older adult should be based on simple, stable, and solid principles. Regarding insertion and removal of the prosthesis, these should be simple to handle for patients as well as caregivers that might be involved in the oral care. The prosthesis should feature a stable design to avoid fractures in case of accidental dropping. Finally, the planning and designing of the prosthetic treatment should be solid, implying that no dental problems are to be expected in near future after completing prosthetic rehabilitation, or if need be, they can be easily modified in case of tooth loss or other biological complications.

The prosthesis should be easy to clean as oral hygiene may be compromised in elderly patients with cognitive or motoric impairment. Meanwhile, proper, and regular instructions should be given and demonstrated not only for patients but also for caring relatives or caregivers. For institutionalized patients, individual labeling of the prosthesis can also be useful to avoid loss or confusion.

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